REMARKS

Applicant traverses the rejections of claims 1, 2, 5-7 and 9-19 under 35 U.S. C. 103(a) by combining Tomita et al. 4,566,911 with Rosenblatt 4,098,728 and Cercone 6,027,573 and claims 1-19 under 35 U.S.C. 103(a) by combining Bahten 6,079,662 with Rosenblatt '728 and Cercone et al '573 and

The specification has been amended to respond to the Examiner's rejections and claims 7, 10 and 18 have been amended to further clarify the same..

Claim 8 is not indefinite as the thickness is correct. The different between the OD and ID of the roller is 30 mm which must be divided by 2 (basic geometry for two concentric circles defining the roller) to obtain the thickness. With regard to the Examiners comments regarding "substantially skinless" it is exceedingly difficult to impossible for a cured or molded product of PVA not to have a an outer surface with a skin of at least a minute magnitude. The present usage is directed toward a product with a minimal skin rather than the thicker formed skin of prior art devices. The pores of the present invention are formed with air rather than starch. The claims have been amended to reflect a pore size opening (page 7, 2nd paragraph). This verbage is consistent with the claim language of Tomita '911.

In regard to the flow of chemicals it is noted on page 6 lines 17 -20 that the flow through rate does not put pressure on the roll during the cleaning process.

Applicant also submits herewith the Declaration of Thomas J. Drury showing that the present invention has surprising results over the products currently being used; namely, the doubling of the effective use life of the roller, a minus defect rate and the halving of chemical end water usage, any one of which would be a surprising or unexpected result. **A minus defect rate means that the inventive rollers cure manufacturing defects which occur in other areas of the chip manufacture.** The prior art rollers during the cleaning process have positive defect rates meaning that certain percentages of chips were rendered unsuitable for use because of the damage caused by the roller and associated chemical and water used in cleaning.

The present product fully meets the rigors of today's CMP methods. While the examiner has combined the attributes of three different patents to form an obviousness rejection, until

the present invention was developed, this was impossible. Some patents use starch for the pore former while others use air as the pore former. These are not combined. The invention combines all of the good physical attributes of a starch (finite sized pore former) based product Tomita/Bahten with the good attributes of a gas or air (strength, durability) formed product Rosenblatt, Cercone, to produce a product superior to any of the cited prior art.

The Cercone et al 6,027,573 and Rosenblatt 4,098,728 patents refer to an air or gas formed polyvinyl acetal sponge product with a very wide range of pore size.(See Figure 4 of the "573 Cercone et al patent) The fact that the range is so wide means that the pore size is really not controlled. A range of 10 to 200 microns produces an inconsistent product with various pore wall thicknesses. Rosenblatt '728 has pore sizes ranging between 0.1mm to 4.0 mm (Example 1: 0.1 -0.5 mm; Example 2: 0.3 - 1.0 mm; Example 3: 0.5 - 4.0 mm; Example 6 0.25 - 1.75 mm)As the cells (pores) of the sponge are formed a bubble of air or gas is surrounded by PVA foam thereby forming a pore. With Cercone '573 and Rosenblatt '728, the pore size can not be controlled in a tight range. (See Rosenblatt '728 Col. 5 lns 28 - 40) The more open the range the greater the variability. In forming the product into a cast or molded form, these variable pores collapse on the surface and form an inconsistent skin on the surface of the sponge.(See Figure 4 of '573 Cercone et al) This negatively impacts the flow rate and the surface properties of this type of roller/brush which is prone to have variable cleaning capability. In use, these brushes have even scratched the surface of the wafers rendering them useless. This product has not been readily accepted by users in the market place.

The Tomita 4,566,911 patent which has been in existence over 17 years has a finite pore formed product which uses starch or other pore formers to produce the foam in a range of 10 to 200 microns. There is no teaching of the specific narrow pore size range or flow characteristics of the present invention. With the use of a solid pore former, a finite sized grain is mixed in with the foam slurry) The cell or pore is formed when the slurry sets up around the grain. The starch acts as a bridge for the foam until the product is cured and then the starch or pore former is washed out leaving a pore. The problems with this type of foam are several fold. First, as the pore former acts as a support for the foam, the foam is weakened when the pore former is washed out. Some minor tearing can even occur during the flushing process which shows a weak stringy type pore under high magnification. These weakened pores tend to breakdown when using today's IPA based cleaning

solutions, interrupting liquid flow and producing negative cleaning results. Secondly, many of the pore forming grains can remain trapped in the material after it is cured, only releasing in use, which causes contamination of the process. (See Figures 6 and 7 of Cercone et al '573) This makes for a much dirtier sponge. See the discussion in Bahten '662 below. When this product is formed, both sponge and starch combine to make a surface skin. This skin requires that the liquid flow pressure be greater to push the cleaning solution through the brush/roller. This results in higher chemistry (water and chemicals) usage and greater stress and breakdown of the skin material resulting in a shorter use life.

The Bahten 6,076,662 patent (assigned to Rippey Corporation)_ is primarily directed toward a cleaning device for PVA brushes. Bahten '662 specifically that the pore size in some embodiments ranges from about 10 microns to about 200 microns and where the average pore size is less than 10 microns the material may have poor elasticity making the performance fo the cleaning roll unsatisfactory. This is basically the same recitation as that of the Tomita '911 patent. The production of Bahten '662 requires adding of a starch to form the pores but does note that other techniques such as an injected foam can be used. (Col 4 lines 45 - 49). It is also noted that other competitive brushes have more impurities. Of significant interest is the listing on Col 7 lines 35 -44 which notes that the rollers of Merocel Scientific Products (Cercone et al '573) and Kanebo Ltd (Tomita et al '911) include a wide variety of impurities that can be detrimental to the manufacture of integrated circuits. On Col. 7 lines 33,34, the Bahten '662 process has a first step providing a plurality of porous polymeric devices which require cleaning. **These are products which have just been manufactured.** Twelve additional complex cleaning steps are required to remove particulate contamination and impurities from the porous polymeric devices. The devices are noted as being "dirty" from the manufacturing process and should be substantially cleaned before use in the manufacturing operation, e.g. semiconductor fabrication. After cleaning a preservative is added such as ammonium hydroxide or other organic biocide and the roller is then packaged.

It is thus seen that the cited references do not teach or obviate the present invention and that the present invention is not apparent from the prior art . Indeed the references cannot be combined as they use different pore forming techniques in the PVA. The invention because of its specific range of pore sizes and fluid flow characteristics has a life span more than double the rollers

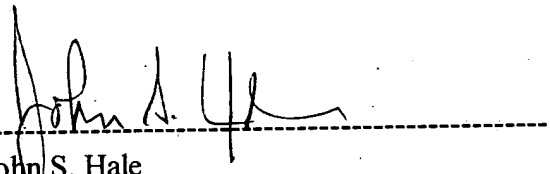
presently being used in the marketplace, uses ½ the chemicals and water currently being used by rollers in the field which are used in the marketplace and has a negative defect rate. As previously noted the inventive rollers when cleaning the silicone wafers do not cause defects as do other competitive rollers) but additionally cure manufacturing defects which occur in the production of the silicone wafers. These are solutions to a long felt need in the industry and are totally unexpected and are surprising results which save large quantities of products, save a significant amount of money in a multibillion dollar industry and have significant environmental benefits.

A one month extension of time together with fee has been filed with this amendment. If any additional charges are required, please charge Deposit Account Number 07-1340. An additional check for the newly added claims is also attached together with a fee cover sheet.

It is respectfully requested that the arguments and amendments present in the present application in condition for favorable reexamination and that the application be passed to issue.

Respectfully submitted,

GIPPLE & HALE



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VERSION OF SPECIFICATION WITH MARKINGS SHOWING CHANGES MADE

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SUMMARY OF THE INVENTION

A substantially skinless cleaning roller of polyvinyl acetal having a uniform small pore size throughout the material in which over 90% of the pores of the material range from 7 - 40 microns in diameter with a mean flow pore diameter of about 20 microns and a mean flow pore pressure of 0.334 PSI. The flow rate through the material provide a dry flow ranging from [25.0] 95.0 L/min to 25.0 L/min and a wet flow of about 80.0 L/min to 6.5 L/min.

to clean semiconductors [and that] in the inventive rollers had greater strength and greater durability.

In a specific embodiment, the devices are made using a suitable material that is firm, porous, elastic, and has certain abrasion resistiveness. The primary raw starting material for the device is air blown polyvinyl alcohol which is used to form a polyvinyl acetal porous elastic material with a uniform cell structure. The porous material varies in characteristic depending upon cleanliness, type of pore forming agent or process, type of aldehyde employed for the conversion of a polyvinyl alcohol to a polyvinyl acetal, and other factors. These factors also include the relative proportions of reactants, reaction temperature and time, and the general condition and starting materials in the manufacturing process.

VERSION OF CLAIMS WITH MARKINGS TO SHOW CHANGES MADE

Claim 1. (Amended) A cleaning device comprising a shaped body made of porous polyvinyl acetal material having a uniform pore [size] openings throughout the material with over 90% of the [pores] pore openings ranging from about 7 microns to about 40 microns in size [diameter].

Claim 5. (Amended) A cleaning device as claimed in claim 1 wherein said polyvinyl acetal material has an average pore [size] opening of about 20 microns.

Claim 6. A cleaning device as claimed in claim 1 wherein said material has about 95% of its pores openings [with a diameter] below 40 microns.

Claim 7. (Amended) A cleaning device comprising a body made of porous polyvinyl acetal material [having] said polyvinyl material having a bubble point pressure of about [0.92] 0.026 PSI.

acetal

Claim 10 (Amended) A semiconductor cleaning device comprising a body made of porous polyvinyl acetal material with a cylindrical roller shape and a smooth outer surface, said material having [a] uniform gaseous formed pore size openings throughout with at least 90% of the pores ranging from about 7 microns to about 40 microns in [diameter] size with a fluid flow through rate which does not distort the roller [during the cleaning process] when fluid is passed through it to clean the same.

Claim 11. (Amended) A semiconductor cleaning device as claimed in claim 10 wherein said polyvinyl acetal material has an average pore [size] opening of about 20 microns.

Claim 12. (Amended) A semiconductor cleaning device as claimed in claim 10 wherein

said material has 95% of its pores with [a diameter] an opening size below 40 microns.

Claim 13. (Amended) A semiconductor cleaning device comprising a shaped body made of porous polyvinyl acetal material with gas formed pores and having at least 95% of its pores with [a diameter]an opening size under 40 microns.

new matter

Claim 16. (Amended) A semiconductor cleaning device comprising a body made of porous polyvinyl acetal material having a uniform pore size throughout the material with at least 95% of the pores being less than 40 microns in [diameter] opening size, said material having a mean flow pore [diameter] opening of about 20 microns.

Claim 18. (Amended) A semiconductor cleaning device comprising a substantially cylindrical roller body made of polyvinyl acetal with a smooth outer surface and uniform material porosity having a mean flow pore pressure [ranging from] of about 0.30 PSI [to about 0.40 PSI] with 90% of its pores ranging from 7 to 40 microns in size and a wet flow rate using water as a medium ranging from about [9.0] 7.0 L/min to [20.0] 80.0 L/min, said pores forming substantially empty cavities.

? support ?

ADD THE FOLLOWING NEW CLAIMS

Claim 20. A semiconductor cleaning device comprising a substantially cylindrical roller body made of polyvinyl acetal with a smooth outer surface and uniform material porosity having a mean flow pore pressure ranging of about 0.30 PSI with 90% of its pores ranging from 7 to 40 microns in size and a dry flow rate ranging from about 25.0 L/min to 95.0 L/min, said pores forming substantially empty cavities.

new matter

Claim 21. A semiconductor cleaning device as claimed in claim 18 wherein said roller

body polyvinyl acetal material has less than 0.1 formaldehyde PPM

Claim 22. A cleaning device as claimed in claim 1 wherein said device is a roller.